WHAT IS CLAIMED IS:

1. A voltage regulator for use in a charging device of a portable electronic apparatus, comprising:

   a transformer having a primary winding and a secondary winding;

   a switch circuit being controlled via a control end thereof so as to result in a variable current on said primary winding;

   a rectification circuit electrically connected to said secondary winding, and proceeding a charging operation in response to an induced current; and

   a micro-controller electrically connected to said switch circuit and generating a pulse width modulation (PWM) signal to said control end in response to said charging operation.

2. The high voltage regulator according to claim 1 wherein said PWM signal has a variable duty cycle.

3. The high voltage regulator according to claim 2 wherein said micro-controller is controlled by a firmware to generate said variable duty cycle.

4. The high voltage regulator according to claim 1 wherein said rectification circuit includes a rectifying diode and a capacitor electrically connected to each other in series and further electrically connected to said secondary winding.

5. The high voltage regulator according to claim 4 further comprising a comparing circuit electrically connected to said capacitor, and providing an operating condition of said charging operation for the reference of said micro-controller.

6. A method for operating a voltage regulator for providing a charging current to a capacitor of a rectification circuit, comprising steps of:

providing a first pulse signal with a first duty cycle to a transformer till said capacitor has a voltage reaching a maximum voltage when said capacitor has a voltage smaller than a threshold voltage, and said transformer generating said charging current in response to said first pulse signal; and

providing a second pulse signal with a second duty cycle to said transformer till said capacitor has a voltage reaching said maximum voltage by said charging current when said capacitor has a voltage between said threshold voltage and said maximum voltage, and said transformer generating said charging current in response to said second pulse signal,

wherein said first duty cycle is greater than said second duty cycle.

7. The method for operating a voltage regulator according to claim 6 wherein said first and said second pulse signals are generated by a micro-controller.

8. The method for operating a voltage regulator according to claim 7 wherein said micro-controller is controlled by a firmware to generate said first and said second pulse signals with said first and said second duty cycles.

9. The method for operating a voltage regulator according to claim 6 wherein said first and said second pulse signals are inputted to a primary winding of said transformer.

10. The method for operating a voltage regulator according to claim 6 wherein said rectification circuit includes a rectifying diode and a capacitor electrically connected to each other in series and further electrically connected to said secondary winding.

11. A method for operating a voltage regulator for providing a charging current to a capacitor of a rectification circuit, comprising steps of:

comparing a voltage of said capacitor with a threshold voltage;

12

adjusting a duty cycle of a pulse signal according to a comparing result of said voltage of said capacitor with said threshold voltage; and

providing said pulse signal to a transformer till said capacitor have a voltage reaching a maximum voltage, and said transformer generating said charging current in response to said pulse signal.

12. The method for operating a voltage regulator according to claim 11 wherein said pulse signal provided to said transformer has a first duty cycle when said capacitor has a voltage smaller than said threshold voltage.

13. The method for operating a voltage regulator according to claim 12 wherein said pulse signal provided to said transformer has a second duty cycle smaller than said first duty cycle when said capacitor has a voltage between said threshold voltage and said maximum voltage.